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EPA Superfund
Record of Decision:

SAVANNAH RIVER SITE (USDOE)
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OU 32
AIKEN, SC
06/18/1996

United States Department of Energy

Savannah River Site

Interim Record of Decision Remedial Alternative Selection for the Old Radioactive Waste Burial Ground (643-E) (U)

WSRC-RP-96-102
Revision 0
March 1996

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY UNDER CONTRACT DE-AC09-89SR18035

WSRC-RP-96-102
Revision 0
March 1996

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Prepared for
U. S. Department of Energy
and
Westinghouse Savannah River Company
Aiken, South Carolina

INTERIM RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

Old Radioactive Waste Burial Ground (643-E)

WSRC-RP-96-102
Revision 0
March 1996

Savannah River Site
Aiken, South Carolina

Prepared by:

Westinghouse Savannah River Company
for the
U.S. Department of Energy Under Contract DE-AC09-89SR18035
Savannah River Operations Office
Aiken, South Carolina

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DECLARATION FOR THE INTERIM RECORD OF DECISION

Unit Name and Location

Old Radioactive Waste Burial Ground (SRS Building Number 643-E)
Savannah River Site
Aiken, South Carolina

The Old Radioactive Waste Burial Ground (ORWBG) (643-E) is a part of the Burial Ground Complex (BGC) which is listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) solid waste management unit/Comprehensive Environmental Response, Compensation and Liability Act (CERLCA) unit in Appendix C of the Federal Facility Agreement (FFA) for the Savannah River Site.

Statement of Basis and Purpose

This decision document presents the selected remedial interim action for the ORWBG located at the SRS in Aiken, South Carolina. The selected action was developed in accordance with CERCLA, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record File for this specific RCRA/CERCLA unit.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Interim Record of Decision (ROD), may present an endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The selected interim action for the ORWBG, Placement of a Soil Cover, consists of placement of a low-permeability soil cover (minimum thickness 2 feet) on top of the existing grade. Topsoil (vegetative soil layer - minimum thickness of 3 inches) would be added and the area compacted and seeded to prevent erosion. Since the ORWBG is a 76-acre area, eight soil cover sections are proposed for the ORWBG.

The proposed soil cover is consistent with the overall site strategy for the BGC because it provides for a reduction in contaminant migration without hindering ongoing characterization efforts conducted as part of the BGC Field Investigation Plan and without precluding any final remedial action developed during the FFA process for the BGC.

This is an interim RCRA/CERCLA action and in no way constitutes a final action for the ORWBG. A final remedial action will be evaluated and conducted in the future according to the requirements of the FFA.

Declaration Statement

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Because this action does not constitute the final remedy for the ORWBG, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume

as a principal element will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by conditions at this ORWBG. Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as development of final remedial alternatives for the ORWBG continues.

3/18/96
Date

T. F. Heenan
Assistant Manager for Environmental Restoration and Solid Waste
U.S. Dept. of Energy, Savannah River Operations Office

6/18/96
Date

John H. Hankinson, Jr.
Regional Administrator
U.S. Environmental Protection Agency

5/30/96
Date

R. Lewis Shaw
Deputy Commissioner
Environmental Quality Control
South Carolina Department of Health and Environmental Control

DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

OLD RADIOACTIVE WASTE BURIAL GROUND (643-E)

WSRC-RP-96-102
Revision 0
March 1996

Savannah River Site
Aiken, South Carolina

Prepared by:

Westinghouse Savannah River Company
for the
U.S. Department of Energy Under Contract DE-AC09-89SR18035
Savannah River Operations Office
Aiken, South Carolina

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I. Site and Operable Unit Name, Location, and Description

The Savannah River Site (SRS) occupies approximately 310 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is a secured U.S. Government facility with no permanent residents. SRS is located approximately 25 miles southeast of Augusta, Georgia and 20 miles south of Aiken, South Carolina.

SRS is owned by the U.S. Department of Energy (DOE). Management and operating services are provided by Westinghouse Savannah River Company (WSRC). SRS has historically produced tritium, plutonium, and other special nuclear materials for national defense. SRS has also provided nuclear materials for the space program and for medical, industrial, and research efforts. Chemical and radioactive wastes are by-products of nuclear material production processes.

The Federal Facility Agreement (FFA) lists the Burial Ground Complex (BGC) as a Resource Conservation and Recovery Act (RCRA)/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) unit that requires further evaluation. The BGC is an area which occupies approximately 195 acres in the central part of SRS between F- and H-Separation Areas, on a nearly flat divide between Upper Three Runs Creek to the north and Four Mile Creek to the south.

The BGC includes the Old Radioactive Waste Burial Ground (ORWBG) (Figure 2) and other operable units such as the Mixed Waste Management Facility (MWMF) (closed under RCRA), the Low Level Radioactive Waste Disposal Facility (LLRWDF), Solvent Tanks S1 - S22 (located in the ORWBG and currently being characterized), Solvent Tanks S23 - S30 (located near LLRWDF, covered under a separate RCRA closure), and Solvent Tank S32 (closed under RCRA).

The ORWBG comprises a disposal area for solid radioactive waste produced at the SRS, as well as shipments from other U.S. Department of Energy and Department of Defense facilities. The ORWBG, designated Building Number 643-E, has a quadrilateral shape and occupies approximately 76 acres. The ORWBG has contributed to localized shallow aquifer groundwater contamination. The plume of groundwater contamination from the ORWBG seeps into the old F-Area effluent stream which flows into Four Mile Creek which in turn flows into the Savannah River. Other RCRA/CERCLA units within the BGC are undergoing characterization and investigation to determine impacts to the environment.

II. Operable Unit History and Compliance History

Operable Unit History

The ORWBG began receiving waste in 1952 and was filled in 1972. The ORWBG was divided into sections to accommodate disposal of various levels/types of radioactive waste materials (Figure 3). These materials include transuranic (TRU) waste, low-level waste, and intermediate-level waste generated at SRS; and waste generated elsewhere.

Compliance History

At SRS, waste materials are managed which are regulated under the RCRA. Certain SRS activities have required Federal operating or post-closure permits under RCRA. SRS received a RCRA hazardous waste permit from the South Carolina Department of Health and Environmental Control (SCDHEC) on September 5, 1995. Part V of the permit mandates that SRS establish and implement an RFI Program to fulfill the requirements specified in Section 3004(u) of the Federal permit.

Hazardous substances, as defined by CERCLA, are also present in the environment at SRS. On December 21, 1989, the SRS was placed on the National Priorities List (NPL).

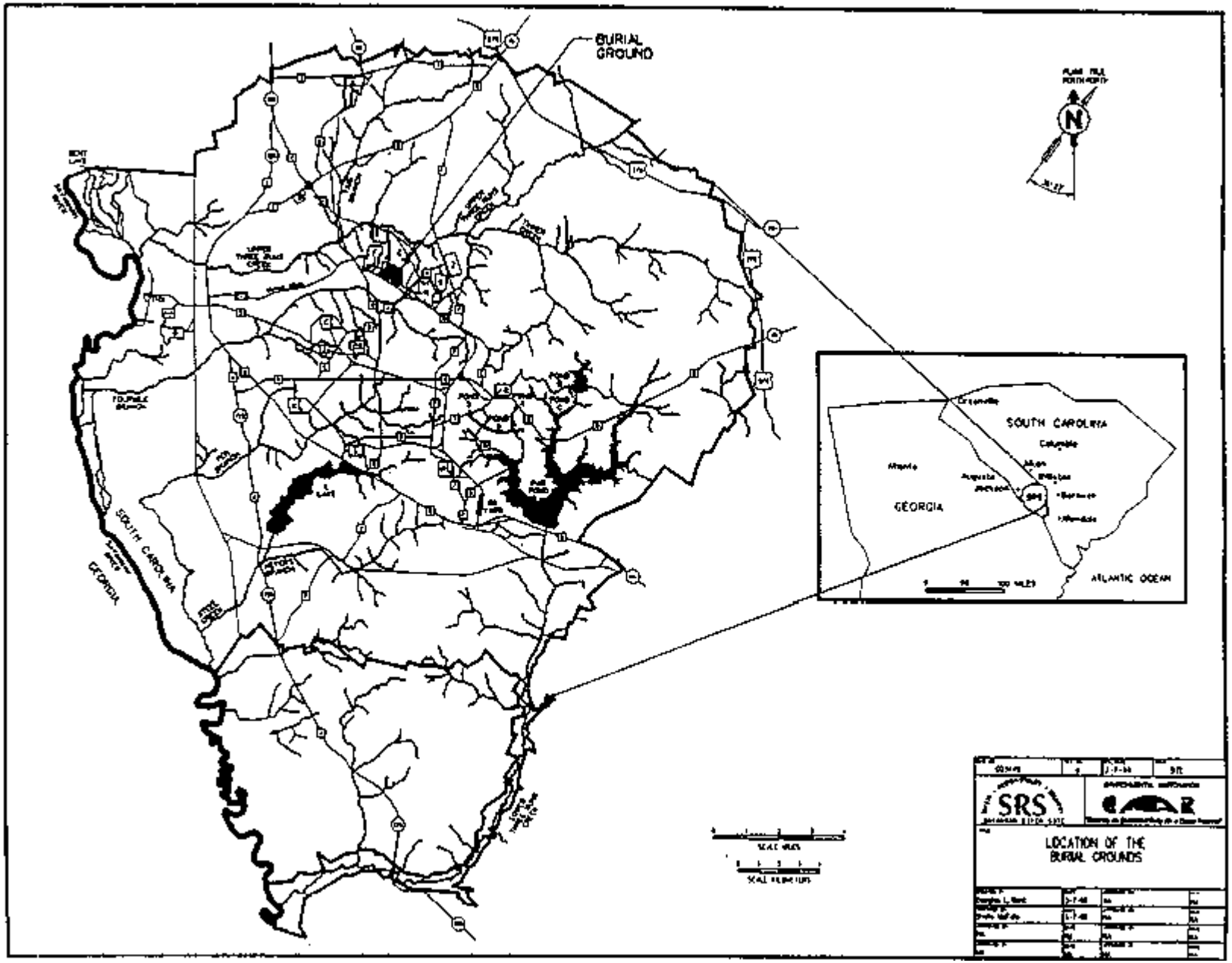


Figure 1. Location of the Burial Ground Complex at the Savannah River Site.

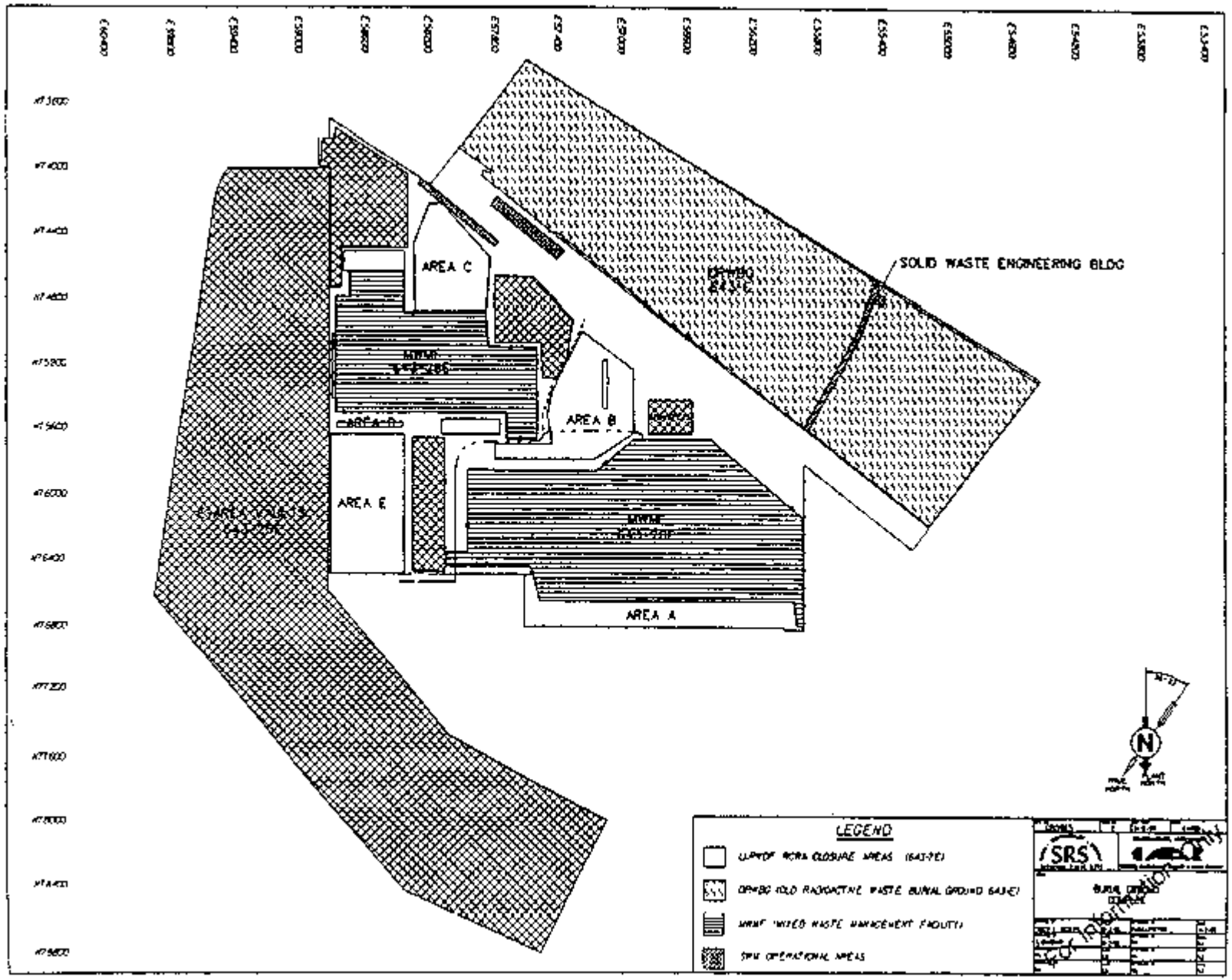


Figure 2. Location of the Old Radioactive Waste Burial Ground.

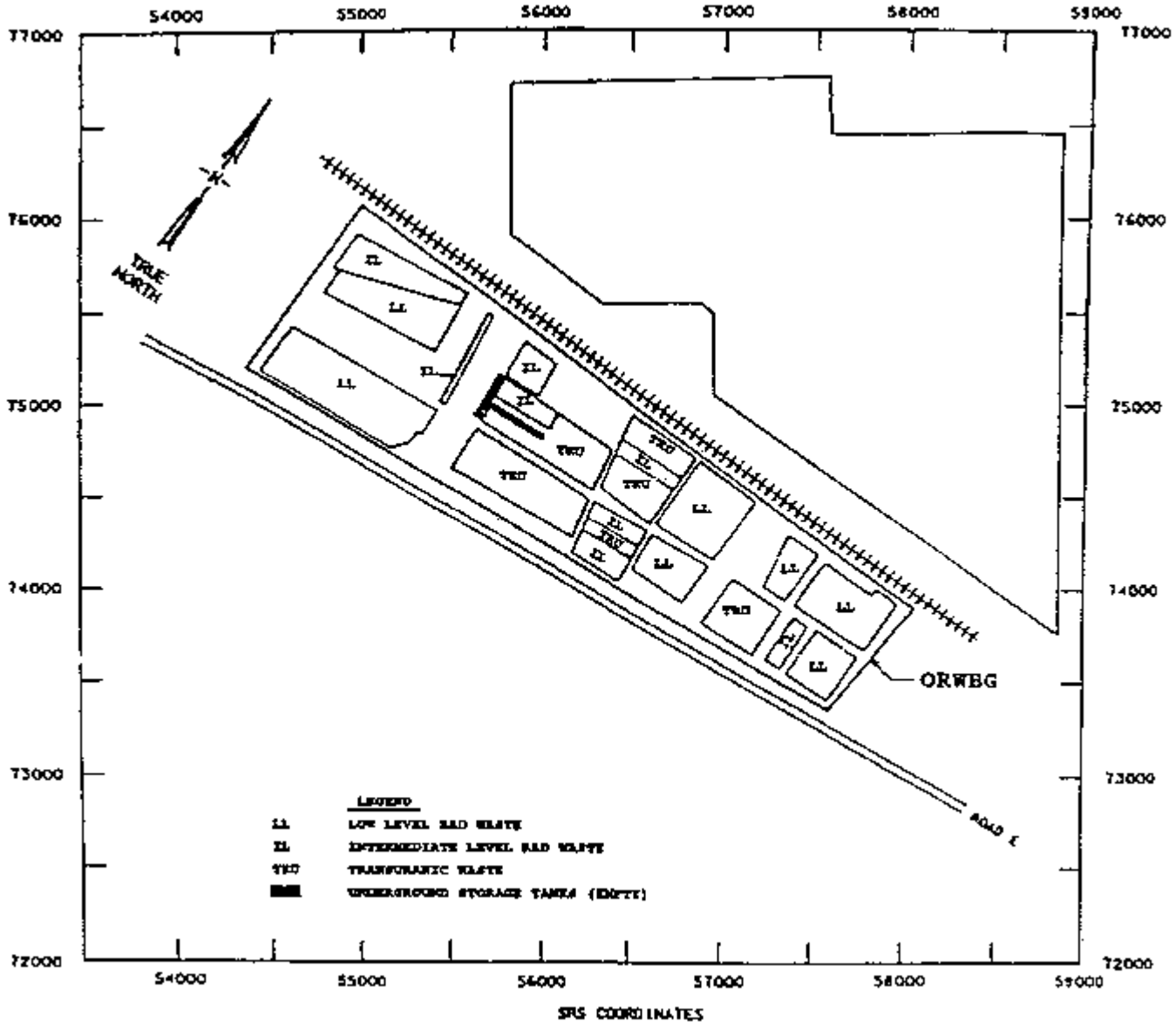


Figure 3. General Locations of Disposal Sections in the Old Radioactive Waste Burial Ground

A site placed on the NPL comes under the jurisdiction of CERCLA. In accordance with Section 120 of CERCLA, DOE has negotiated an FFA (FFA, 1993) with the U.S. Environmental Protection Agency (EPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements.

III. Highlights of Community Participation

Public participation requirements are listed in Sections 113 and 117 of CERCLA. These requirements include the establishment of an Administrative Record File that documents the investigation and selection of the remedy for addressing the ORWBG. The SRS Public Involvement Plan (DOE, 1994) is designed to facilitate public involvement in the decision-making processes for permitting, closure, and the selection of remedial alternatives. The SRS PIP addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act (NEPA). Section 117(a) of CERCLA, as amended, requires the preparation of a proposed plan as part of the site remedial process. The *Interim Action Proposed Plan for the Old Radioactive Waste Burial Ground (643-E)* (WSRC, 1995), which is part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the ORWBG.

The Administrative Record File, which contains the information pertaining to the selection of the response action, was made available at the EPA office and at the following locations:

U.S. Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina-Aiken
171 University Parkway
Aiken, South Carolina 29801
(803) 641-3465

Thomas Cooper Library
Government Documents Library
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

Similar information is available through the repositories listed below:

Reese Library
Augusta College
2500 Walton Way
Augusta, Georgia 30910
(706) 737-1744

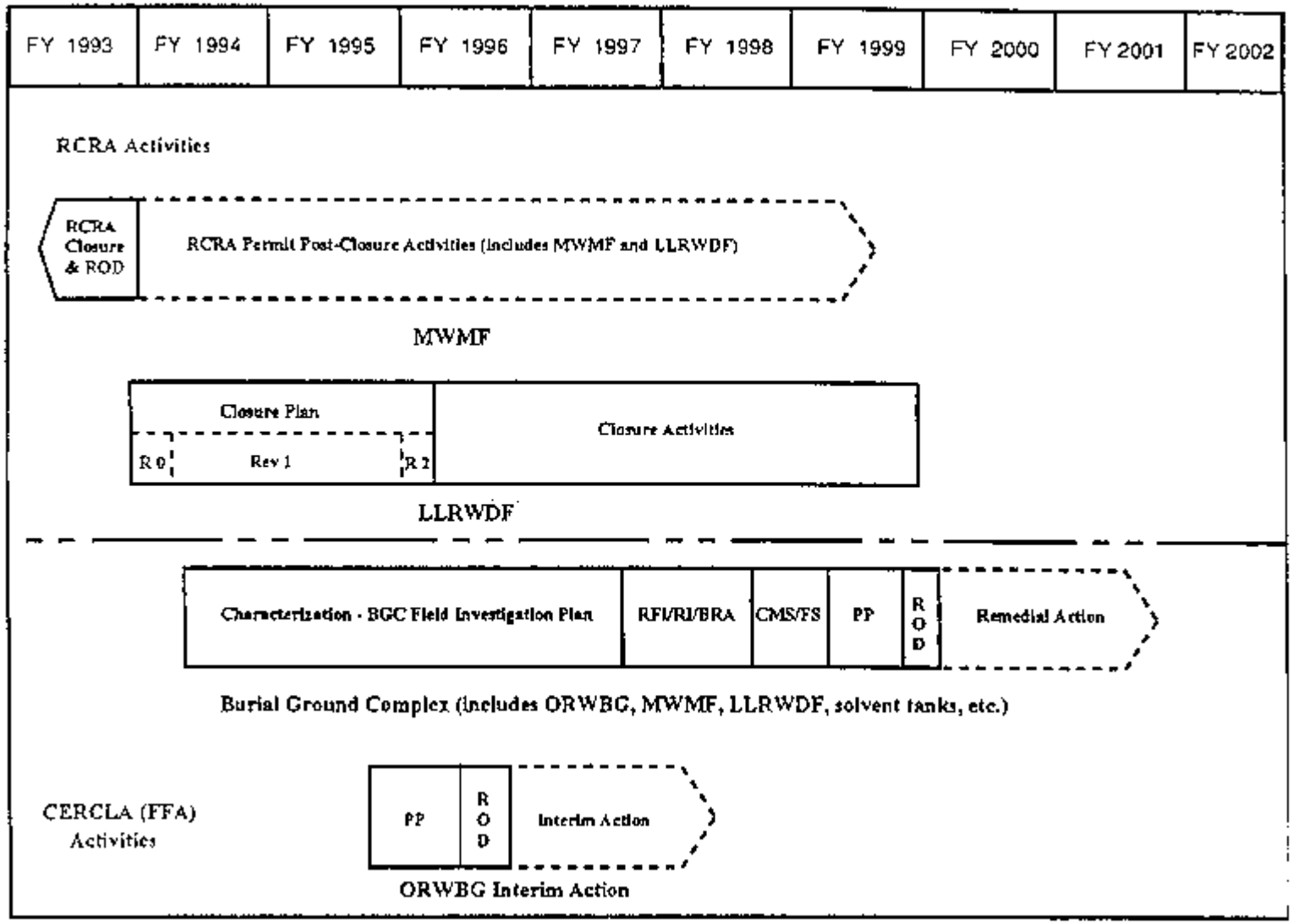
Asa H. Gordon Library
Savannah State College
Tompkins Road
Savannah, Georgia 31404
(912) 356-2183

The public was notified of the comment period for the proposed plan through mailings of the *SRS Environmental Bulletin*, a newsletter sent to approximately 3500 citizens in South Carolina and Georgia, and through notices in local newspapers including the *Aiken Standard*, *The State*, *Augusta Chronicle*, *North Augusta Star*, *Barnwell People-Sentinel*, *Allendale Citizen Leader*, and the *Augusta Focus*.

The public comment period began on February 2, 1996 and ended on March 2, 1996. A public meeting was held on February 27, 1996 at the North Augusta Community Center. Comments received on the *Interim Action Proposed Plan for the Old Radioactive Waste Burial Ground (643-E)* are addressed in the Responsiveness Summary (Appendix A).

IV. Scope and Role of Operable Unit Within the Site Strategy

The BGC includes the ORWBG and other operable units (OUs) such as the MWMF (closed under RCRA), Solvent Tanks S1 - S22, Solvent Tanks S23 - S30, Solvent Tank S32 (closed under RCRA), and the LLRWDF. The overall plan for characterization and remediation at the BGC is presented in Figure 4. This figure shows both RCRA and



Note: The dotted lines represent approximate activity duration.

Figure 4. Burial Ground Complex Project Schedule.

CERCLA estimated project schedules for the major activities at the BGC.

The entire BGC is listed as one OU under CERCLA. The investigation/assessment process will address all of the facilities, including those which have been closed under RCRA. Once appropriate characterization data is available and a risk analysis has been performed, a final remedial action for the BGC will be implemented. The MWMF was closed (via capping) under RCRA and had a ROD issued in fiscal year (FY) 1993. The LLRWDF is currently undergoing closure (via capping) under RCRA.

Groundwater associated with the entire BGC is being addressed under the RCRA permit for the MWMF in accordance with the second amendment to Settlement Agreement 87-52-SW. Revision 3 to the RCRA Part B permit application of the MWMF was submitted to SCDHEC on November 15, 1995. This revision to the RCRA application includes a characterization of the plume which originates from the ORWBG. It also prepares a strategy and schedule for characterization, development of clean up levels, and preparation of remediation plans for each of the separate plumes of contamination associated with the BGC.

Characterization for the BGC is currently ongoing through the BGC Field Investigation Plan (FIP) and will encompass environmental releases from all facilities within the BGC (MWMF, LLRWDF, ORWBG, etc.). Characterization data currently available for the BGC indicates that the ORWBG has contributed to localized shallow aquifer contamination. Given this information and the current FFA process schedule for the BGC (remedial action currently planned to begin in FY 2001), an interim action is necessary for the ORWBG.

The role of the interim action at the ORWBG unit is a reduction in stormwater infiltration through the waste layer which will minimize contaminant migration to the water table. The interim action proposes to place a low-permeability soil cover over the ORWBG unit. Topsoil with a vegetative cover will also be a part of the interim action. The soil cover will be sloped to promote surface runoff, minimize surface erosion, and control the leaching of hazardous substances from the source material.

Existing institutional controls, environmental monitoring, and site maintenance would also be components of this alternative. Visual inspection of the soil cover will be performed by trained individuals at regular intervals and after significant rainstorms. Any observed damage, erosion, or subsidence will be repaired to conform with the original soil cover contours.

This interim action addresses source control at the ORWBG in advance of the final remedial action for the BGC. The proposed soil cover is consistent with the overall site strategy because it provides for a reduction in contaminant migration without hindering ongoing characterization efforts conducted as part of the BGC FIP and without precluding any final remedial action developed during the FFA process for the BGC.

The BGC FIP is a comprehensive environmental characterization plan which was submitted to SCDHEC in January 1995. The plan describes an aggressive program to collect hydrogeologic, groundwater, soil, and surface water data to support all RCRA and CERCLA activities for the burial ground complex. The FIP calls for a variety of technologies to be used in characterization. These include water sampling and geologic data collection using innovative direct push technologies, installation of new monitoring wells, coring, geophysical logging, wetlands sampling, and pumping tests to determine aquifer properties.

Implementation of the FIP is well underway. Characterization of the plume at the ORWBG has been completed in accordance with the FIP and submitted to SCDHEC in

revision 3 to the RCRA Part B permit application for the MWMF.

Groundwater sampling via Cone Penetrometer hydrocone and Hydropunch to delineate the vertical and lateral extent of the three burial ground plumes has been completed. Twenty three (23) new wells have been installed to monitor groundwater flow and contamination in the vicinity of the groundwater divide. Soil, wetlands, and stream sampling are in progress. Data evaluation is ongoing.

Additional coring and water sampling to gather information in data sparse areas around the burial ground are planned for later this year. This data will be used to improve the ability of groundwater models to predict future contaminant migration. This data will also improve our ability to model the interaction effects of multiple caps and groundwater remediation projects in the vicinity of the burial ground. Pumping tests to gain information which will support corrective action design are being planned and are scheduled for execution in FY 1997.

The results of the BGC FIP will be used to develop the BGC RFI/RI/BRA. The results of the RFI/RI/BRA will be used to develop the final remedial alternatives for the BGC including the ORWBG.

V. Summary of Operable Unit Characteristics

The history of the ORWBG is summarized from the *Phase II RFI/RI Work Plan for the Burial Ground Complex* (WSRC, 1994). The ORWBG began receiving waste in 1952 and was filled in 1972.

Examples of materials disposed of at the ORWBG include the following:

- Incidental waste from laboratory and production operations,
- Contaminated equipment,
- Lead,
- Reactor hardware,
- Spent deionizer resins,
- Spent lithium-aluminum targets,
- Irradiated process oil from pumps in the tritium facilities and reactor areas,
- Mercury from gas pumps in tritium facilities,
- Cadmium,
- Scintillation fluid, and
- Shipments from off-site (e.g., radioactive waste from military hardware).

Earthen trenches within the ORWBG were excavated 20 feet wide, 20 feet deep, and up to 700 feet long. The trenches were filled with the materials listed above. Trenches were covered with 4 feet or more of soil to reduce surface radiation to less than 6 mR/hr.

Beginning in 1962, records were kept of the contents, radiation level, and approximate storage location of each shipment of waste. Many of the waste volumes and radionuclide quantities were estimated, including information on waste disposed of before 1962. The location of the burial/storage area for each shipment of waste was defined by a 100 foot grid system laid out in 1962. These grids were further divided into 20 foot squares.

Until 1965, TRU waste contained within plastic bags and cardboard was buried in unlined trenches designated specifically for this waste. Between 1965 and 1972, TRU waste was segregated according to TRU content. Waste that did not fit into the prefabricated concrete containers was encapsulated in-place in concrete.

Inorganic constituents, such as lead (used to shield a variety of waste forms or discarded due to high contamination levels) and cadmium (from control rods, safety rods, and shielding), were placed in the ORWBG.

One trench in the east-central part of the ORWBG approximately 100 feet long was

used for disposal of an unknown quantity of empty oil drums.

From 1953 through 1968, organic solvents were incinerated in open shallow unlined trenches located in the north-central part of the ORWBG.

Various solvents including napthalene, n-paraffin, toluene, tributylphosphate (TBP), TBP-kerosene, trimethylbenzene, ultrasene, and xylene were stored in 22 underground storage tanks at the ORWBG. However, the cleanup of these tanks are not being addressed as part of this proposed interim action. The action for closure of the solvent tanks will be addressed in a separate proposed plan and will therefore be without a cover until the final remedial action is initiated.

VI. Summary of Operable Unit Risks

General Risk Information

At the present time, a risk assessment for the BGC (including the ORWBG) has not been conducted, but is scheduled to be completed by November 1997. The risks, in general, are the contaminants in the buried waste. These contaminants have been released to the soil and groundwater due to infiltration and percolation. Future releases of contaminants to the soil and groundwater can be reduced by reducing infiltration and percolation from stormwater/rain events, thereby minimizing future risks.

The estimated stormwater infiltration for the ORWBG existing conditions is 45% for a given rainfall event over a twenty year period. After installation of the soil cover, it is estimated that the stormwater infiltration will decrease to 13% for a given rainfall event over a twenty year period. Therefore, this soil cover yields a 70% reduction in the amount of water infiltration through the waste layer and reduces the potential for introducing contaminants into the groundwater (Serrato, 1994).

The reduction in stormwater infiltration is consistent with the goals of the National Oil and Substances Pollution Contingency Plan (NCP) because it provides risk reduction early in the investigation/assessment process without precluding any final action. The soil cover will control the source hazards by reducing contaminant migration and, minimizing future groundwater remediation efforts. Additionally, the soil cover will not prevent initiation of any final action developed after full characterization and risk analysis have been completed for the BGC.

Constituents of Concern (COCs)

The focus of this interim action is to control the leaching of hazardous substances from the source material into the groundwater.

The information listed below was summarized from the *RFI/RI Work Plan for the Burial Ground Complex (U)* (WSRC, 1994).

Soil gas surveys conducted at the ORWBG indicate that the chlorinated solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) were observed to be widely distributed in the ORWBG. Observations of 1,1,1-trichloroethane were also observed, but were not as widely distributed as the PCE and TCE.

Scattered, low levels of carbon tetrachloride, chloroform, and trans-1,2-dichloroethylene were also observed. The most significant observations of trans- 1,2-dichloroethylene were found in the central part of the ORWBG. Concentrations range from 201 to 1000 ppbv and appear to correlate with low concentrations of PCE in this area. It is suggested that the trans- 1,2-dichloroethylene may be present as the result of biological degradation of PCE.

Only a few, widely spaced observations of the aromatic hydrocarbons benzene, toluene, ethylbenzene, and xylenes were made in the ORWBG. The saturated hydrocarbons, C_6-C_9, were observed with a slightly greater frequency than the aromatics. In particular,

hexane, heptane, and octane are well correlated with the observations of trans-1,2-dichloroethylene. No observations of decane were made. Pentane is widely distributed in low concentrations.

The levels of methane observed at the ORWBG vary. The higher levels of methane result from the anaerobic biological degradation of buried waste. Lower levels of methane and the other light hydrocarbons may be due to the natural background in this area.

Historically, groundwater data indicate that the tritium concentrations in wells monitoring the ORWBG average 140,745 pCi/mL and range from 15 pCi/mL to nearly 30 million pCi/mL. The nonvolatile beta concentrations average 107 pCi/L and range from 0.15 pCi/L to greater than 9000 pCi/L. The gross alpha concentrations average 4 pCi/L and are generally less than 35 pCi/L. As discussed earlier, radioactive materials were disposed of in sections of the ORWBG according to the type and level of radioactivity of the waste. Water samples containing high levels of tritium, nonvolatile beta emitters, or gross alpha emitters were obtained from wells monitoring sections of the ORWBG in which waste containing high concentrations of these constituents was buried. Concentrations of these constituents throughout the ORWBG thus vary considerably, and are generally much lower than the upper ranges noted above.

Metallic constituents have also been found in the ORWBG groundwater samples. These metals include cadmium, mercury, and lead. Mercury and lead concentrations have been shown to be highest in the northeast section of the ORWBG. Cadmium concentrations appear to be highest in the southwestern portion of the ORWBG.

Gas chromatography/mass spectrometry analysis of groundwater below the ORWBG indicated the presence of 63 organic compounds. Many of these compounds were indicative of spent solvent, oil and liquid scintillation wastes, and degradation products of humic substances. Four priority pollutants (benzene, toluene, phenol, and napthalene) were present in low concentrations. Acetophenone, a RCRA Appendix IX constituent, was tentatively identified in the groundwater.

The concentrations of ten priority pollutant volatile organic compounds detected in groundwater samples near the ORWBG include carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethylene, trans-1,2-dichloroethane, toluene, PCE, TCE, and 1,1,1-trichloroethane. Five of these volatile organic compounds (carbon tetrachloride, 1,2-dichloroethane, PCE, 1,1,1-trichloroethane, and trans-1,2-dichloroethane) occurred in concentrations above their respective maximum concentration limits. The highest number and concentrations of volatile organic compounds occurred along the southern boundary of the ORWBG.

VII. Description of the Considered Alternatives

Three alternatives were evaluated for interim action remediation of the contamination at the ORWBG. Each alternative is described below:

Alternative 1
No Action.

Alternative 2
Placement of a Soil Cover

Alternative 3
Placement of a RCRA-Like Cap

All three alternatives include engineering and administrative controls to guard against inadvertent human and ecological exposure to contamination. Also, ongoing monitoring and approved characterization plans will continue during remediation.

The alternatives must meet or attain applicable or relevant and appropriate requirements (ARARs). The following statutes and

regulations were reviewed as potential ARARs and To-Be-Considered (TBC) guidance:

- Atomic Energy Act
- RCRA
- Clean Air Act
- Safe Drinking Water Act
- Clean Water Act
- Toxic Substances Control Act
- South Carolina Pollution Control Act
- South Carolina Wastewater Regulations
- South Carolina Drinking Water Regulations
- South Carolina Air Pollution Control Regulations
- South Carolina Water Classification Standards
- South Carolina Well Standards and Regulations
- South Carolina Hazardous Waste Management Regulations
- Stormwater Management and Sediment Reduction
- DOE Orders

After reviewing the above mentioned statues and regulations, there were no location-specific ARARs and TBC guidance identified. Chemical-specific and action-specific ARARs and TBC guidance are listed in Table 1.

Alternative 1 - No Action.

Under Alternative 1, the ORWBG would remain in its current condition. Concentrations and activity levels of the COCs would gradually be reduced with time through natural attenuation processes such as dispersion and radioactive decay. Contaminated groundwater would continue to discharge into surface waters. Stormwater would continue to infiltrate into the trenches and leach contaminants into the groundwater. The no action alternative limits future characterization due to “As Low As Reasonably Achievable (ALARA)” issues.

Existing institutional controls, environmental monitoring, and site maintenance would continue and would be components of the no action alternative. This alternative is currently being implemented. There are no capital costs associated with this alternative. Maintenance and operation costs will be fairly similar from alternative to alternative; and is therefore not discussed separately.

Alternative 2 - Placement of a Soil Cover

Under Alternative 2, no buried waste material would be removed. A series of low-permeability soil covers would be installed on top of the existing grade. A vegetative layer of 50% topsoil, 50% common soil would be added and the area compacted and seeded to prevent erosion.

Each low-permeability soil cover section will have a minimum thickness of 2 feet of compacted, low-hydraulic conductivity soil (nominal in-place saturated hydraulic conductivity of 1×10^{-5} cm/sec or less) (Bennett, 1996). The soil covers will also have an upper surface with a slope to promote surface runoff and minimize surface erosion.

The vegetative layer will be placed at a minimum thickness of 6 inches and will have the ability to survive and function with little or no maintenance (Bennett, 1996). The surface slope will also promote runoff and minimize surface erosion.

The soil cover sections could be easily repaired should destruction of portions of the covers occur through subsidence or cover intrusion be required for future assessments or remedial actions. The soil covers provide shielding for future waste/“hot spot” removal, if required (Frye-O’Bryant et al., 1993). “Hot spot” removal, in conjunction with placement of the soil cover, is not being proposed at this time, based on the following:

- the nonhomogeneous nature and disposition of the wastes in the ORWBG (landfill-like)
- “hot spot” source exact location is unknown (within the waste unit)

Table 1. Applicable or Relevant and Appropriate Requirements and To-Be-Considered Guidance.

Actions	Requirements	Prerequisites	Federal Citation	South Carolina Code of Laws
CHEMICAL-SPECIFIC				
Protection of the general public from all sources of radiation	The general public must not receive an effective dose equivalent greater than 100 mrem/year.	Dose received by the general public from all sources of radiation exposure at a DOE facility - **TBC guidance**	DOE Order 5400.5; DOE Order 5820.2A	
	All releases of radioactive material must be ALARA	Releases of radioactive material from DOE activities - **TBC guidance**	DOE Order 5400.5	
Worker Protection	Maintains worker exposures to ALARA	Internal and external sources of continuous exposure to occupational workers at a DOE facility - **TBC guidance**	DOE Order 5480.11; DOE Order 5820.2A	
	Radiation Protection for Occupational Workers	Control of radiation exposures to occupational workers at a DOE facility - **ARAR**	10CFR835	
ACTION-SPECIFIC				
Erosion Control	Develop a plan for erosion sediment control	Land disturbing activities - **Applicable**		SC 72-300
Closure Activities	During closure, residual radioactivity levels for surface soils shall comply with existing DOE decommissioning guidelines.	Disposal site closure activities - **TBC guidance**	DOE Order 5820.2A	

Acronyms Used in Table 1

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
DOE	Department of Energy
SC	South Carolina
TBC	To-Be-Considered

- current characterization technologies would not provide location of "hot spot" sources, and
- if the BGC RFI/RI/FS process concludes "hot spot" source and/or "waste retrievals" are to be done, this interim action soil cover will not preclude that action and will provide additional shielding for the final action remediation workers.

The existing groundwater monitoring wells within the covered area will need to be extended to meet the increased elevation or abandoned (Frye-O'Bryant et at., 1993).

Existing institutional controls, environmental monitoring, and site maintenance would also be components of this alternative. Visual inspection of the soil cover will be performed by trained individuals at regular intervals and after significant rainstorms. Any observed damage, erosion, or subsidence will be repaired to conform with the original soil cover contours.

This alternative could be implemented in approximately 18 months. This timeframe is required for the construction activities related to erosion control, the sedimentation basin, and the soil and vegetative covers. The time required for preparation and regulatory approval of the IAPP, Interim Action Record of Decision (IROD), and the combined Remedial Design/Remedial Action Work Plan/Remedial Design Report is independent of the 18 months required for construction.

The estimated capital cost for this alternative is $10 million for 76 acres. The cost estimate is based on previous closure cover systems constructed at the SRS and economic evaluation studies for closure cover systems at hazardous waste units. The estimated unit cost for this alternative is $3 per square foot. The major subtasks associated with this alternative are:

- design and construction of the soil layer,
- stormwater management system design, construction, and permitting,
- health and safety documentation development, and
- support and indirect tasks.

Alternative 3 - Placement of a RCRA-Like Cap

Under Alternative 3, no buried waste would be removed. The existing cover soil will be prepared for the placement of the foundation layer. Once the foundation layer is placed, placement of the final low-permeability cover system (cap) will be completed. The cap could possibly consist of the following materials: geogrid, geosynthetic clay liner, flexible membrane liner, and a geocomposite drainage layer. Topsoil (vegetative cover) would be added and the area compacted and seeded to prevent erosion.

The cap would meet more stringent criteria (e.g., 1×10^{-7} cm/s permeability or less) and the topsoil (vegetative cover) would meet the same requirements as described in Alternative 2. The cap complicates implementation of future characterization, if required, without loss of containment integrity. The groundwater monitoring wells will also need to meet the same requirements as listed in Alternative 2.

Existing institutional controls, environmental monitoring, and site maintenance would also be components of this alternative.

This alternative could be implemented in approximately 24 months. This timeframe is required for the construction activities related to the RCRA-like cap. The time required for preparation and regulatory approval of the IAPP, IROD, and the combined Remedial Design/Remedial Action Work Plan/Remedial Design Report is independent of the 24 months required for construction.

The estimated capital cost for this alternative is $25 million for 76 acres. The cost estimate is based on previous closure cover systems constructed at the SRS and economic

evaluation studies for closure cover systems at hazardous waste units. The estimated unit cost for this alternative is $7.5 per square foot. The major subtasks associated with this alternative are:

- design and construction of the RCRA-like cap,
- stormwater management system design, construction, and permitting
- health and safety documentation development, and
- support and indirect tasks.

VIII. Summary of Comparative Analysis of the Alternatives

Description of Nine Evaluation Criteria

Each of the interim remedial alternatives was evaluated using the nine criteria established by the NCP. The criteria were derived from the statutory requirements of CERCLA Section 121. The NCP [40 CFR § 300.430 (e) (9)] sets forth nine evaluation criteria that provide the basis for evaluating alternatives and selecting a remedy. The criteria are:

- overall protection of human health and the environment,
- compliance with ARARs,
- long-term effectiveness and permanence,
- reduction of toxicity, mobility, or volume through treatment,
- short-term effectiveness,
- implementability,
- cost,
- state acceptance, and
- community acceptance.

The interim remedial action alternatives discussed in the Section VII have been evaluated using the nine criteria listed above. Table 2 presents the evaluation of the alternatives.

Brief descriptions of these criteria are given below.

Overall Protection of Human Health and the Environment - The interim action remedial alternatives are assessed to determine whether they adequately protect human health and the environment from unacceptable risks posed by hazardous substances at the unit. The alternatives must eliminate, reduce, or control exposure levels established during development of remediation goals.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) - ARARs are Federal and state environmental regulations that establish standards which remedial actions must meet. There are three types of ARARs: (1) chemical-specific, (2) location-specific, and (3) action-specific.

Chemical-specific ARARs are usually health-or risk-based, levels or methodologies which, when applied to unit-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the surrounding environment. Often these numerical values are promulgated in Federal or state regulations.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations. A unit's location is a fundamental determinant of its impact on human health and the environment. Some examples of specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

Action-specific ARARs are usually technology- or remedial activity-based requirements or limitations on actions taken with respect to hazardous substances or unit-specific conditions. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy.

The remedial activities are assessed to determine whether they attain ARARs or provide grounds for invoking one of the five waivers for ARARs. These waivers are:

Table 2. Evaluation of Alternative Actions Considered for Remediation of ORWBG Contamination.

Evaluation Criteria	*Alternative 1 No Action*	*Alternative 2 Placement of a Soil Cover, Without Excavation and Removal of Buried Waste*	*Alternative 3 Placement of a RCRA-Like Cap, Without Excavation and Removal of Buried Waste*
Overall Protection of Human Health and the Environment	Minimal	This alternative is protective of human health and the environment.	This alternative is protective of human health and the environment.
Compliance with ARARs	There are no ARARs associated with this alternative.	Other than worker protection standards, there are no ARARs associated with this alternative.	Other than worker protection standards, there are no ARARs associated with this alternative. However, RCRA guidance on caps are To-Be-Considered.
Long-term effectiveness and permanence	This evaluation criteria does not apply to Interim Actions.	This evaluation criteria does not apply to Interim Actions.	This evaluation criteria does not apply to Interim Actions.
Reduction of toxicity, mobility, or volume through treatment	This alternative does not reduce toxicity, mobility, or volume through treatment since there is no treatment process.	This interim remedial action will decrease leachate production and will reduce contaminant transport to the groundwater and as such a reduction in mobility of contaminants will occur.	This interim remedial action will decrease leachate production and will reduce contaminant transport to the groundwater and as such a reduction in mobility of contaminants will occur. This alternative provides a greater reduction in mobility of contaminants than Alternative 2.
Short-term effectiveness	This alternative does not provide a short-term remedy for preventing discharges of contaminated groundwater to surface streams.	This alternative will decrease leachate production and will reduce contaminant transport to the groundwater.	This alternative will decrease leachate production and will reduce contaminant transport to the groundwater.

Table 2. Evaluation of Alternative Actions Considered for Remediation of ORWBG Contamination (con't).

Evaluation Criteria	*Alternative 1 No Action*	*Alternative 2 Placement of a Soil Cover, Without Excavation and Removal of Buried Waste*	*Alternative 3 Placement of a RCRA-Like Cap, Without Excavation and Removal of Buried Waste*
Short-term effectiveness (con't)		Since risks to the offsite population are minimal, no measures to protect the community will be required during remediation and during the time period before remedial goals are met. Protection of workers will be required during cover installation. Monitoring of this area will continue and therefore, exposure to the current (non-remediation) workers will be reduced.	Since risks to the offsite population are minimal, no measures to protect the community will be required during remediation and during the time period before remedial goals are met. Protection of workers will be required during cover installation. Monitoring of this area will continue and therefore, exposure to the current (non-remediation) workers will be reduced.
Implementability	This alternative is already in place.	The cover material is readily available from onsite sources. This alternative could be implemented in about 18 months. This timeframe does not include the time necessary for document preparations, regulatory review, etc.	The cap materials are available from off-site vendors. This alternative could be implemented in about 24 months. This timeframe does not include the time necessary for document preparations, regulatory review, etc.
Cost	Capital Cost = None	Capital Cost = app. $10 million	Capital Cost = app. $25 million
State Acceptance	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following the review by the appropriate regulatory agencies.	This criterion will be completed following the review by the appropriate regulatory agencies.
Community Acceptance	This criterion will be completed following public review.	This criterion will be completed following public review.	This criterion will be completed following public review.

- the remedial action is an interim measure and will become a part of a total remedial action that will attain the ARAR,
- compliance will result in greater risk to human health and the environment than other alternatives,
- compliance is technically impracticable from an engineering perspective,
- the alternative remedial action will attain an equivalent standard of performance through use of another method or approach,
- the state has not consistently applied the promulgated requirement in similar circumstances or at other remedial action in the state.

Long-Term Effectiveness and Permanence- Long-term effectiveness and permanence does not apply to an interim action.

Reduction of Toxicity, Mobility, or Volume Through Treatment - The interim action remedial alternatives are assessed based on the degree to which they employ treatment that reduces toxicity, mobility, or volume of contaminants associated with the unit.

Short-Term Effectiveness - The interim action remedial alternatives are assessed considering factors relevant to implementation of the remedial action, including risks to the community during implementation, impacts on workers, potential environmental impacts (e.g., air emissions), and the time until protection is achieved.

Implementability - The interim action remedial alternatives are assessed by considering the difficulty of implementing the alternative including technical feasibility, constructability, reliability of technology, ease of undertaking additional remedial actions (if required), monitoring considerations, administrative feasibility (regulatory requirements), and availability of services and materials.

Cost - The evaluation of remedial alternatives must include capital and operational and maintenance costs. Present worth costs are estimated within +50/-30 percent, per EPA guidance. In estimating the present worth cost, a discount rate of five percent is used and inflation is considered to be zero percent. This discount represents the estimate of dollar value in future years. A sensitivity analysis will be used when sufficient uncertainty exists regarding the design, implementation, operation, or effective life of an alternative. The cost estimates given with each alternative are prepared from information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs may vary from the estimates presented herein.

State Acceptance - The alternatives assessment must evaluate state concerns. State acceptance will be addressed through the state's participation in the FFA process.

Community Acceptance - Community comments regarding the various components of alternatives will be assessed. Public comments concerning the proposed remedy will be incorporated into the Responsiveness Summary of the IROD.

IX. The Selected Remedy

Alternative 2, Placement of a Soil Cover, has been selected as the preferred interim action. This alternative consists of placement of a low-permeability soil cover (minimum thickness 2 feet) on top of the existing grade. A vegetative layer - minimum thickness of 6 inches would be added and the area compacted and seeded to prevent erosion.

Each low-permeability soil cover section will have a minimum thickness of 2 feet of compacted, low-hydraulic conductivity soil (nominal in-place saturated hydraulic conductivity of 1×10^{-5} cm/sec or less)

(Bennett, 1996). The soil covers will also have an upper surface with a slope to promote surface runoff and minimize surface erosion.

The topsoil (vegetative soil layer) will be placed at a minimum thickness of 3 inches and will have the ability to survive and function with little or no maintenance (Bennett, 1996). The surface slope will also promote runoff and minimize surface erosion.

The soil cover sections could be easily repaired should destruction of portions of the covers occur through subsidence or cover intrusion be required for future assessments or remedial actions. The soil covers provide shielding for future waste/"hot spot" removal, if required (Frye-O'Bryant et al., 1993). "Hot spot" removal, in conjunction with placement of the soil cover, is not being proposed at this time, based on the following:

- the nonhomogeneous nature and disposition of the wastes in the ORWBG (landfill-like)
- "hot spot" source exact location is unknown (within the waste unit)
- current characterization technologies would not provide location of "hot spot" sources, and
- if the BGC RFI/RI/FS process concludes "hot spot" source and/or "waste retrievals" are to be done, this interim action soil cover will not preclude that action and will provide additional shielding for the final action remediation workers.

The existing groundwater monitoring wells within the covered area will need to be extended to meet the increased elevation or abandoned (Frye-O'Bryant et al., 1993).

Visual inspection of the soil cover will be performed by trained individuals at regular intervals and after significant rainstorms. Any observed damage, erosion, or subsidence will be repaired to conform with the original soil cover contours.

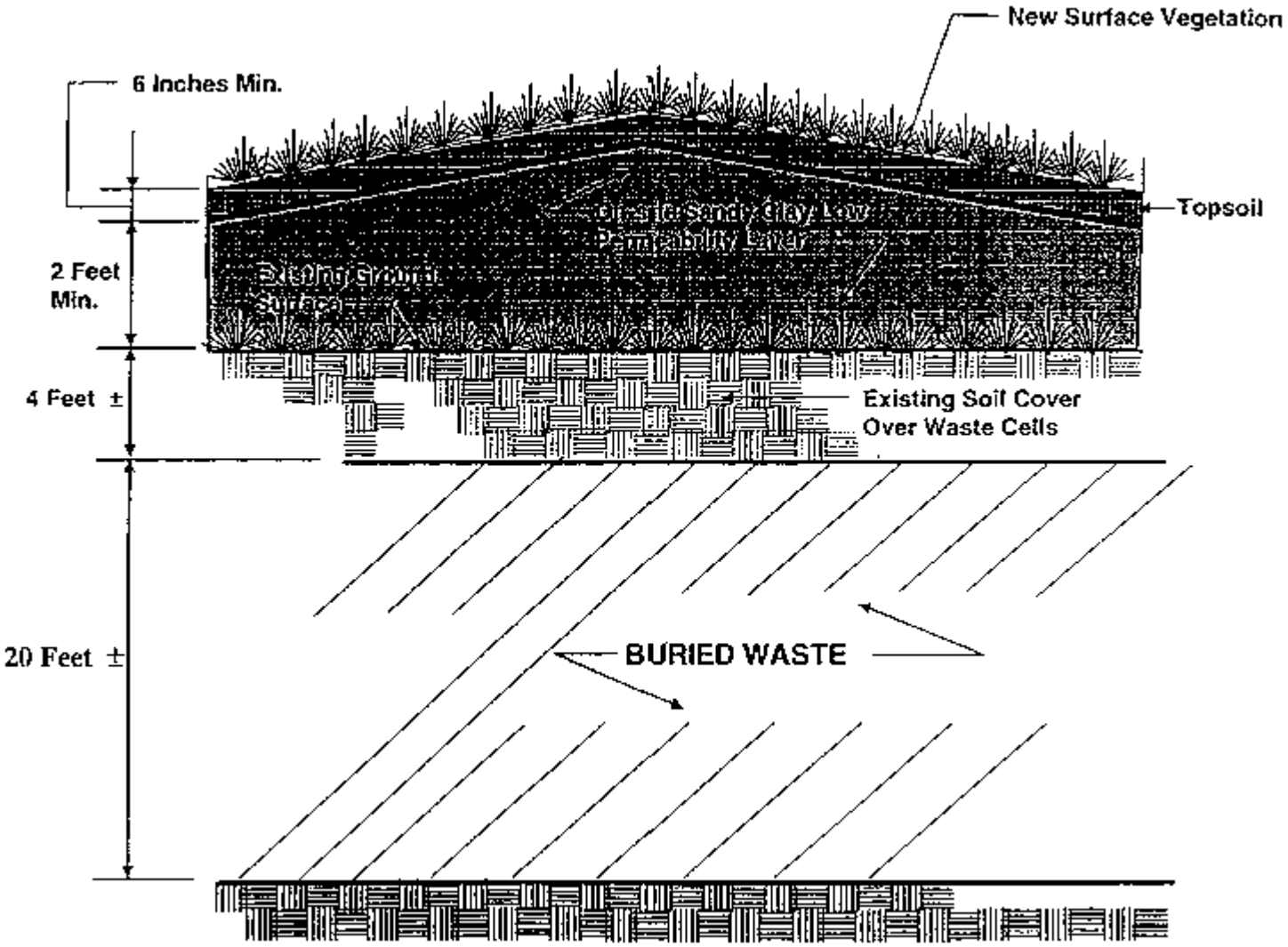
This alternative could be implemented in approximately 18 months. This timeframe is required for the construction activities related to erosion control, the sedimentation basin, and the soil and vegetative covers. The time required for preparation and regulatory approval of the IAPP, Interim Action Record of Decision (IROD), and the combined Remedial Design/Remedial Action Work Plan/Remedial Design Report is independent of the 18 months required for construction.

The estimated capital cost for this alternative is $10 million for 76 acres. The cost estimate is based on previous closure cover systems constructed at the SRS and economic evaluation studies for closure cover systems at hazardous waste units. The estimated unit cost for this alternative is $3 per square foot. The major subtasks associated with this alternative are:

- design and construction of the soil layer,
- stormwater management system design, construction, and permitting,
- health and safety documentation development, and
- support and indirect tasks.

A combined Remedial Design/Remedial Action Work Plan/Remedial Design Report will be submitted for regulatory review in March 1996. This combined document will provide additional details regarding the soil cover.

This alternative was selected because it would (1) decrease the stormwater infiltration rate and contaminant migration to the groundwater, thus minimizing future impacts to the groundwater, (2) provide increased radiation shielding from buried waste at the ground surface, (3) be easily repaired should destruction of portions of the cover occur through subsidence, and (4) provide versatility for future characterization and removal activities. A cross-section of this alternative is shown in Figure 5. The cross-section is representative of one of the eight proposed soil cover sections.



Note: *Drawing Not To Scale*

This cross-section is representative of one of the eight proposed soil cover sections.

Figure 5. Old Radioactive Waste Burial Ground Soil Cover Configuration.

Alternative 2 is an interim action and in no way constitutes a final action for the ORWBG. A final remedial action will be evaluated and conducted in the future according to requirements of the FFA. The solvent tanks remediation will be addressed at that time.

X. Explanation of Significant Changes

There were no significant changes made to the Interim Record of Decision based on the comments received during the public comment period for the Interim Action Proposed Plan. Six sets of comments were received and are addressed in Appendix A. However, the comments did not have an impact on the soil cover preferred alternative decision. Some of the text was revised to better clarify the information presented.

XI. References

Bennett, J. T., 1996. *Task Requirements and Criteria: Old Radioactive Waste Burial Ground, 643-E Interim Soil Cover (U)*, Q-TC-E-00001, Rev. 1, Westinghouse Savannah River Company, Aiken, South Carolina.

DOE (U.S. Department of Energy), 1994. *Public Involvement, A Plan for the Savannah River Site*. Savannah River Operations Office, Aiken, South Carolina.

EPA (U.S. Environmental Protection Agency), 1989. *Guidance on Preparing Superfund Decision Documents*. Office of Solid Waste and Emergency Response - OSWER Directive 9355.3-02.

EPA (U.S. Environmental Protection Agency), 1991. *Guide to Developing Superfund No Action, Interim Action, and Contingency Remedy RODs*. Office of Solid Waste and Emergency Response - OSWER Directive 9355.3-02FS-3.

FFA, 1993. *Federal Facility Agreement for the Savannah River Site*, Administrative Docket No. 89-05-FF, (Effective Date: August 16, 1993).

Frye-O'Bryant, R. C., T. F. Gaughan, S. R. McMullin, and M. G. Serrato, 1993. *Evaluation of Temporary Cover Configurations for the Old Radioactive Burial Ground (U)*, WSRC-RP-93-1154, Westinghouse Savannah River Company, Aiken, South Carolina.

Serrato, M. G., 1994. *Old Burial Ground Soil Cover - HELP Model Evaluation (U)*, WSRC-RP-94-1128, Westinghouse Savannah River Company, Aiken, South Carolina.

WSRC (Westinghouse Savannah River Company), 1994. *RFI/RI Work Plan for the Burial Ground Complex (U)*, WSRC-RP-90-1140, Rev. 2, Westinghouse Savannah River Company, Aiken, South Carolina.

WSRC (Westinghouse Savannah River Company), 1995. *Interim Action Proposed Plan for the Old Radioactive Waste Disposal Facility (643-E) (U)*, WSRC-RP94-1225, Rev. 1, Westinghouse Savannah River Company, Aiken, South Carolina.

APPENDIX A

RESPONSIVENESS SUMMARY

Responsiveness Summary

The public comment period for the Interim Action Proposed Plan (IAPP) for the Old Radioactive Waste Burial Ground (ORWBG) began on February 2, 1996 and ended on March 2, 1996. A public meeting was held on February 27, 1996. Six sets of comments were received on this proposed interim action. Specific comments and responses are found below. The comments are italicized and the responses are bolded.

Public Comments

Memo, dated February 22, 1996

To: Ms. Mary A. Flora
Public Involvement

From: W. Lee Poe, Jr., Private Citizen
Aiken, SC

Subject: Interim Action Proposed Plan for the Old Radioactive Waste Burial Ground (643-G)

I would like to offer several comments on Revision 1 of WSRC-RP-94-1225. I read the Interim Action Plan and found it to be quite readable but filled with unnecessary abbreviations (all defined in the List of Acronyms).

In view of these comments and perhaps a fundamental error in water percolation rate (see comment S-7) affecting the preferred alternative, I would like to have the opportunity to review the revised report before the decision is reached to implement the interim action.

I have grouped my comments into two groups; they are General Comments and Specific Comments. They are as follows:

General Comments

G-1) The report needs information stating what the risk is. Section I.V.B makes the point that storm water infiltration is leaching organics, metals, and radionuclides from the buried waste. A small amount of information is included on the groundwater concentrations of some of these materials but nowhere could I find anything that talks about the significance of these materials in the groundwater and its danger to the public. Buried in Table 2 is the statement that the risk to the offsite population is minimal. I saw no other mention of the level of risk in the Interim Action. The analysis is, in my judgment, inadequate. The analysis should identify what radionuclides, organics, and metals are released from the burial grounds to the creek and reach the public and what the consequences to the public are. Only after this information is available can a proper decision be reached.

Response to G-1:

A baseline risk assessment (BRA) for the ORWBG has not yet been completed. A Burial Ground Complex BRA (that will include the ORWBG) will be completed in November 1997 and will provide the information about risk that you are requesting. Please keep in mind that this proposed action is an interim action; the intent of the soil cover is to limit the migration of contamination into the groundwater in the short term while more information is being acquired and the final solution is being developed.

G-2) If the risk is minimal (as stated in Table 2) and further evaluation is being conducted for other parts of the Burial Ground Complex, I believe that the No-Action Alternative is the appropriate to take for this Interim Action. (I offer this conclusion with some concern because I do not believe that the risk is minimal as stated.) I do not believe that DOE should spend 10 million dollars for an interim action where the risk is minimal. I recognize that WSRC, DOE, SCDHEC, and EPA have all reviewed this issue and are in agreement. I think they must be caught up in administrative details that direct some action be taken. The No Action Alternative is action.

Response to G-2:

Based on information from groundwater and surface water monitoring, the current risk to the offsite public is minimal. It is the potential future risk that is posed by the inventory of wastes in the burial ground that is being addressed. At this time, the No Action alternative is a valid option that has been seriously considered. However, because the development of a final remedy will take time, it seems prudent to take some action that will minimize additional groundwater contamination and yet not interfere with our ability to undertake future actions.

G-3) The report contains no information on how releases from the groundwater to the streams and the river will be affected by the proposed action. This information should be included.

Response to G-3:

The soil cover will minimize the continued migration of contamination to the groundwater and ultimately to the surface streams, but will not substantially affect the contamination which already exists in the groundwater and surface streams. Detailed information about the groundwater at the Burial Ground Complex is contained in the RCRA Part B permit application for the MWMF. Work is in progress toward the development of a RCRA groundwater corrective action plan for the plume of contamination at the ORWBG.

G-4) Applicable or Relevant and Appropriate Requirements (ARAR) are stated to be an evaluation criteria. In Table 1, ARAR are identified and I see no requirement that specifically relate to differences to the alternatives. Only high level DOE Orders and a single SC regulation are listed; those things that will and must be done anyway like protect the workers and public. Table 2 says that no differences between alternatives exist for this criteria. Recognizing this when the report was prepared, this criteria should have been deleted. It didn't help make the decision.

I would like to quote a finding of the National Research Council related to the Hanford Waste Tank Program since it must be applicable here. The NRC found that DOE and the regulators establish "priorities that are driven by narrow interpretations of regulations rather than regulation's purpose of protecting the public health and environment." Quote is from ***Barriers to Science - Technical Management of the Department of Energy Environmental Remediation Program****.*

Response to G-4:

The ARARs listed in Table 1 were based on what SRS believed to be the applicable ARARs for this interim action after reviewing the list of statues and regulations shown on page 12 of the ORWBG IAPP. The ARAR section in Table 2 is required by CERCLA. Although, it may not have assisted in the decision-making process, it should be shown in order to indicate that the ARARs were reviewed during the process of selecting the remedial alternatives.

G-5) Section IV.D is so general that it is not useful to this Interim Action report. The only useful portion is the last part (Description of the Preferred Alternative) which is redundant but serves as a good summary. I suggest making it into an executive summary.

Response to G-5:

Section IV.D serves as a summary of the information on the preferred alternative. It discusses the evaluation of the alternatives against the nine criteria established under CERCLA. The section also provides a synopsis of the applicable information on the preferred alternative. The Interim Action Proposed Plan was developed in accordance with CERCLA guidance on proposed plans and records of decision development.

G-6) Throughout the report the No-Action alternative is referred to as not requiring actions. In reality the No-Action Alternative does require actions to maintain the burial grounds. These sections should be expanded to show what is being done to maintain the burial ground. Table 2 is particularly objectionable on this point.

Response to G-6:

The descriptions of alternatives in the IAPP were intended to contrast the capital costs, actions, and expected results of the three alternatives, beyond current ongoing ORWBG maintenance activities. Table 2 was intended to present a concise comparison of the three alternatives versus the nine evaluation criteria established by CERCLA. Ongoing maintenance activities in the ORWBG include regular grass mowing, monthly inspections for subsidence, and weekly inspections of the drainage system for erosion and sediment control. These maintenance activities would continue as a part of all three alternatives described in the IAPP. Clarifying language will be incorporated into the IROD to make this clearer.

Specific Comments

S-1) In Figure 1, the Burial Ground arrow points to a blank part of the Site. I know where the burial ground is located but others will not.

Response to S-1:

Figure 1 was revised to better show the location of the Burial Ground.

S-2) Figure 2 is illegible. It needs subtitles to show where the parts that are discussed in Section I are located. The Legend is of no help - all areas look alike.

Response to S-2:

Figure 2 was revised to ensure that the reader can see where the parts that are discussed in Section I are located. The Legend was also revised to make it easier to understand.

S-3) Section III last sentence talks about soil cover. Add statement that it will be maintained. It was discussed later but it would help the reader to see it here as well.

Response to S-3:

A statement was added to the Scope and Role of Operable Unit or Response Action Within the Site Strategy section of the Interim Record of Decision (IROD) to show that the soil cover will be maintained.

S-4) Figure 3 needs to be improved to show the relevance for this Interim Action for the ORWBG. The test says this figure shows the CERCLA activities. I couldn't see any CERCLA on the figure. The text and the figure do not support each other.

Response to S-4:

The referenced figure was improved for inclusion in the IROD for the ORWBG. Additional headers were added to designate RCRA and CERCLA (FFA) activities. The purpose of the figure is to show all of the RCRA and CERCLA (FFA) activities at the Burial Ground Complex and their relative timeframe.

S-5) Section IV.A (Unit Description and Location section) should also talk about the proximity of streams that serve to transport effluents to offsite personnel.

Response to S-5:

A description of the proximity of streams was included in the IROD (see Section I). The plume of groundwater contamination from the ORWBG seeps into the old F Area effluent stream which flows into Four Mile Creek which in turn flows into the Savannah River. Levels of tritium do exceed drinking water standards in Four Mile Creek.

S-6) Initial paragraph on page 10 says that the old solvent tanks (in the middle of the ORWBG) will not be covered in the proposed action. One would logically ask why not? We don't want water flowing past them either. I could find no reason for not covering them when you are covering the rest of the ORWBG. It would probably be less expensive to cover it all at one time.

Response to S-6:

The original design included coverage of the ORWBG solvent tanks; however, the assumption was that stabilization of the tanks would be completed prior to the start of soil cover construction. In further examination of the ORWBG solvent tank remediation schedule, it was determined that tank stabilization would not be initiated until late 1997. These tanks must be stabilized prior to placement of the soil cover because of their questionable structural integrity. The current design for the soil cover is such that the area left uncovered (administrative area and solvent tanks) will drain properly.

The ORWBG solvent tank stabilization/ remediation would be completed after the soil cover has been placed, but prior to the initiation of the Burial Ground Complex final action. Therefore, the solvent tanks have been omitted as a part of the soil cover interim action and will be pursued as a separate action.

*S-7) The first paragraph of Section IV.B is unclear or inaccurate. It says that the current soil cover reduces the infiltration by 45% to 2.1 inches percolation. The new soil cover will decrease infiltration to 13%. The paragraph goes on to say that this equates to an infiltration rate of 0.05 inches of water. Using these values, I see no way of getting a 0.05 inch value. For example if the 13% value is of the current infiltration the new percolation rate would be 2.1 * 0.13 = 0.27" infiltration. If the 13% of the rainfall, the infiltration rate would be significantly more. Please correct the information. It may make a difference on the alternative selected.*

Response to S-7:

The text in the IROD has been revised for clarity and accuracy.

S-8) The subsection of IV.B on Constituents of Concern would be improved considerable by comparing these pollutants to health standards and to those found in commercial landfills. How much organics and metals are found in say the Aiken Landfill that was abandoned 10 or so years ago. This would help establish how bad the problem is and how this ORWBG compares to other burial grounds or landfills.

Response to S-8:

Levels of contaminants in the groundwater plume at the ORWBG are compared to levels of the same constituents at the SRS sanitary landfill and the A/M Area plume in the table below. Groundwater remediation programs are in place at both the landfill and the A/M Area. Contamination in A/M area is from past discharge of non-radioactive waste solvents to an unlined basin and is representative of pollution from a non-nuclear industrial facility. Contamination at the SRS sanitary landfill results from the burial of trash that would be typical of municipal landfill waste.

COC	Units	MCLs	ORWBG Maximum	A/M Area Maximum	Sanitary Landfill Maximum
1,1-Dichloroethylene	ug/l	7	24	32	9
Carbon tetrachloride	ug/l	5	5.5	-	-
Chloroform	ug/l	100	191	-	-
Lead	ug/l	15	82	51	65
Mercury	ug/l	2	4.11	-	2.54
Tetrachloroethylene	ug/l	5	304	65,000	41
Trichloroethylene	ug/l	5	339	21,000	62
Tritium	pCi/l	20,000	286,000,000	-	130
Gross Alpha	pCi/l	15	132	-	35
Uranium-233/234	pCi/l	alpha = 15	108	-	-
Uranium-238	pCi/l	alpha = 15	231	-	-
Carbon-14	pCi/l	-	4,900	-	-

MCL- Federal Maximum Concentration Level (drinking water standard)

S-9) The second paragraph on page 14 raises the possibility of abandoning the old wells in the burial ground. Don't abandon them. They are historically important for comparison and should continue to be used to study the condition in the burial ground. This is doubly important since none of the wells show a uniform water contamination indicating that we have a non-uniform contamination pattern under these burial grounds.

Response to S-9:

The monitoring wells within the boundary of the ORWBG have been abandoned in order to facilitate construction activities in support of the placement of a soil cover. However, a network of wells monitor both groundwater quality at the perimeter of the burial ground and the plumes which originate from the Burial Ground Complex. This monitoring network consists of over one hundred wells which monitor three aquifer zones in accordance with an approved RCRA groundwater sampling and analysis program. Historical data from the water table wells within the ORWBG, in conjunction with the RCRA monitoring network and groundwater samples collected by direct push technology (a geologic sampling tool that is pushed into the ground to collect groundwater samples), provide sufficient groundwater data to fully characterize groundwater at the Burial Ground Complex.

S-10) Section IV.D seems to have no use as written. See comment G-5.

Response to S-10:

See response to comment G-5.

S-11) The first sentence of the last paragraph, page 17, is internally redundant. If it is an interim action by its definition it is not a final action. The last part does not need to be said.

Response to S-11:

SRS realizes that the first sentence of the last paragraph on page 17 is internally redundant. However, the sentence was added so that there would be no confusion in thinking that this was the final action for the ORWBG.

S-12) Table 2 needs some work to be the basis for the decision to use Alternative 2. I would like to offer several comments on how I think the table could be made more useful. They are:

- *Comment G-6, above, talks to the need to better define the actions associated with the No Action Alternative.*
- *In the row on protection of the health and safety and of the environment, amplify the levels of protection provided by the various alternatives with technical judgments and how these levels of protection are provided. As written Alternatives 2 and 3 are simply "trust me" statements with no ability to independently verify.*
- *Delete ARAR and Long-term effectiveness and permanence from the table. All alternatives are the same. If it is necessary to be included then, do it with a footnote.*
- *Reduction of toxicities, mobility, etc. could be improved by using some numbers.*
- *Short-term effectiveness needs to discuss the amount of organics, metals, and radionuclides in the water table and some estimate of those transported to the groundwater. This should be followed with information on the rate of discharge to the creek for the three alternatives.*
- *Update the State Acceptance row of data. Based on Section II, they have approved the Interim Action.*

If you or any of the technical people associated with making the revisions requested have any questions, please call me at (803) 642-7287.

Response to S-12:

1st bullet: See the response to general comment G-6, above.

2nd, 4th, and 5th bullets: The comments all suggest additional quantifying data for Table 2 is currently not available. Characterization activities for the Burial Ground Complex are underway and should provide the hard data needed for the decisions on the final action, which will be presented in a future Proposed Plan. The scope of this interim action is limited in nature and is only focused on reducing stormwater infiltration through the ORWBG waste trenches. SRS has high confidence that the result will be decreased contaminant transport. The data necessary to quantify the specific levels of reduction is not yet available.

3rd bullet: ARARs and long-term effectiveness are required to be reviewed for all actions by the CERCLA. SRS realizes that these alternatives are not really applicable for an interim action and the information in Table 2 is repetitive. SRS believes that the information should remain in the table.

6th bullet: SCDHEC and EPA have not approved the Interim Action. Section II indicates that SCDHEC and EPA (along with DOE) are soliciting public review and comment on the "proposed" plan for this interim action. It further indicates that

DOE, SCDHEC, and EPA will select a remedial action following the public comment period. This decision will be documented in the Record of Decision (ROD) for this interim action. The ROD will include a Responsiveness Summary which addresses comments and concerns received during the public comment period.

Comments from the February 27, 1996 Public Meeting as recorded in the ORWBG Public Meeting transcript.

1) Why wasn't waste removal considered as an alternative?

Response to 1:

Much more knowledge is necessary before serious consideration is given to removing radioactive items from the ORWBG. Investigation activities are ongoing at the BGC which may provide that type of knowledge. In the interim, rainwater infiltration through the buried waste can be addressed without hampering the ability to gain more specific knowledge through investigation/assessment activities at the BGC.

2) Why aren't the solvent tanks being addressed at this time?

Response to 2:

The original design included coverage of the ORWBG solvent tanks; however, the assumption was that stabilization of the tanks would be completed prior to the start of soil cover construction. In further examination of the ORWBG solvent tank remediation schedule, it was determined that tank stabilization would not be initiated until late 1997. These tanks must be stabilized prior to placement of soil cover because of their questionable structural integrity. The current design for the soil cover is such that the area left uncovered (administrative area and solvent tanks) will drain properly.

The ORWBG solvent tank stabilization/ remediation would be completed after the soil cover has been placed, but prior to the initiation of the Burial Ground Complex final action. Therefore, it is recommended that the solvent tanks be omitted as a part of the soil cover interim action and be pursued as a separate action.

3) Are the tanks full of solvents; if not, where is the solvent?

Response to 3:

These are old empty solvent tanks that are buried. These old underground tanks do not meet the current standards for storage of organics, much like at a gas station. New tanks were constructed to meet all the current standards. The solvents that were in the old tanks were transferred into the new tanks. Ultimately, the plan is to incinerate the solvents in the Consolidated Incineration Facility when it becomes operational.

4) Is the final action going to stop more percolation of the rainwater leaching through the area more so than this interim action?

Response to 4:

The final action will be determined when more information about the nature of what is buried in the ORWBG and what impact it is having on the environment has

been established. The objective of the remedial process is to establish goals for a cleanup action. The goal of this action is limited and focused on reduced infiltration. This is a near-term goal that will have environmental benefit while SRS is in the process of developing the final goals.

5) Do you know exactly what and where everything is buried in the ORWBG?

Response to 5:

Records exist which give two dimensional locations for waste burials. These records also contain waste type and quantity for each burial.

6) Do you have certain items that should be dug up and removed from the old burial site?

Response to 6:

See Response to 1.

7) Why was the Mixed Waste Management Facility closed in 1991?

Response to 7:

The Mixed Waste Management Facility (MWMF), a portion of the Burial Ground Complex, was addressed under the RCRA regulations and was closed with a RCRA cap. Mixed waste refers to waste that contains both radioactive and hazardous components. The MWMF was permitted for radioactive, but not hazardous waste. In 1986, SRS determined that the facility should be closed because the waste it received contained some materials - such as lead, silver, cadmium, and waste oils - classified as mixed waste under RCRA. Through a settlement agreement with the South Carolina Department of Health and Environmental Control (SCDHEC), the MWMF cap closure was completed in 1991.

8) What is RCRA?

Response to 8:

RCRA stands for the Resource Conversation and Recovery Act. RCRA is a set of regulations which deal with the identification, management, and disposal of hazardous wastes. RCRA includes provisions for the permitting of treatment, storage, and disposal facilities.

9) What materials will be used to create the cover system over the ORWBG?

Response to 9:

The cover system for the interim action is going to be a large quantity of sandy clay soil. This soil cover will be adequate to reach the goal of this interim action (reduce infiltration).

10) Is this actually a short-term solution?

Response to 10:

This is the appropriate time to put something in place to reduce infiltration. It is a short-term action to reduce infiltration while full characterization of the site continues and the long-term solution is developed. This interim action will reduce the infiltration, but will not preclude going in and characterizing the waste for potential removal in the future.

If the short-term solution was to place a RCRA cap, such as that at the Mixed Waste Management Facility, on the ORWBG, then infiltration is mitigated. However, if characterization or excavation activities occur, the cap is torn up and ruined. The cap would be very costly to fix.

11) How long will this interim action be in place prior to the final action implementation?

Response to 11:

The schedule is to get the final remedial decision started at this site by the year 2001. So short-term is the five years that this action will be in place. However, SRS could have gone through the entire remedial process of characterizing all the contaminants toward a final remedy on the traditional path, but that would continue to allow contamination to migrate to the groundwater while evaluation takes place. The scope of the interim action is a soil cover over the ORWBG. This will allow for continued characterization and selection of a final remedy, while protecting the groundwater in the interim.

12) Is placement of a soil cover over the ORWBG predisposing or eliminating future options?

Response to 12:

All of the options will be evaluated to see if they're viable and protective. There will be a very detailed evaluation for the final remedy. It will have to be based on the technical as well as the protectiveness criteria. There will be a very stringent comparison of remedies and whether or not they're protective, cost- effective, and meet all of the nine criteria of CERCLA.

An innovative technology may be appropriate; however, not enough information is known at this time to proceed with final action. This interim action does not preclude any future options, including identification and removal of hot spots. This interim action is for mitigating the contamination pathway to groundwater. By reducing groundwater contamination now, there will be less polluted groundwater to deal with in the future.

13) Why not look at less costly alternatives like paving the ORWBG?

Response to 13:

A paved area is a very impermeable surface layer. There would be more rainwater runoff. The soil cover acts to absorb some of the water initially; and, then it will release it over time so as not to have a very large flow of water all at one time. An asphalt type cover system or a tarp would require much more money to be spent on

the drainage system. SRS would need to build larger sedimentation basins and collection systems to carry the stormwater away. Therefore, the overall cost of the proposed soil cover would be in the same range with some of those alternatives.

The ORWBG currently is not well drained. Although measures have been taken by SRS Solid Waste Operations over the years to improve the situation, the problem remains that the ORWBG is essentially a large, flat area with undersized ditches and culverts. Any interim action that seeks to reduce infiltration will increase stormwater runoff. Therefore, regardless of the configuration chosen (soil cover, RCRA cap, tarp cover, or other), if the interim action decreases infiltration (thereby increasing runoff), the same magnitude of earth moving will have to occur to achieve a 3%-5% finished slope to promote proper drainage. Additionally, an upgraded stormwater management system, with larger ditches/piping/culverts will be required, regardless of the chosen option. Therefore a certain "earth moving/drainage improvement cost baseline" is established for any interim action alternative which reduces infiltration.

The soil cover alternative is a technically simple alternative to design and construct which does not interfere with future characterization or waste removal activities. The tarp cover alternative would involve essentially the same amount of earth moving and drainage improvement work, plus about 65 acres of the tarp cover to buy, place, and maintain. The permeability of such a tarp cover system would be lower, but the added value of this was judged to be marginal when balanced against the initial and recurring costs of such a large tarp area. For this reason, the tarp cover system was not considered as an alternative in the IAPP.

14) *The waste added to the burial ground will become contaminated just like the topsoil is now. So the more you put on it, the more you're going to have to recover later on. You have to understand contamination. And it can purge upward as well as go out into your groundwater. It can purge and come up. So you're not going to stop it. I mean stop it temporarily and this is what the interim action is going to do. If you understand contamination, if you've ever been around contamination you'll know what I'm talking about.*

Response to 14:

Current waste disposal practices have changed The practices that were in place back during that period of time were not as stringent as our current practices for disposal of waste. Today, SRS no longer buries radioactive waste. The waste is volume reduced and then placed in large concrete vaults built by construction.

15) *Is the TRU waste placed in vaults?*

Response to 15:

The TRU waste is not put in vaults. It's currently stored in above-ground storage.

16) *It looks like a good interim action but there are a couple of questions that I have. First off, one of the things that we know about adding a soil cover is that it raises groundwater levels. Have you taken that into account and how will you deal with that? Will that be a factor or will that be a concern?*

Response to 16:

Based on experience with capping the MWMF and the F and H Seepage Basins, SRS expects the groundwater levels at the ORWBG to fall slightly in response to the soil cover. This is because the primary input of water at the ORWBG is from rainwater and the soil cover will minimize the amount of rainwater infiltration. In addition, the water table is approximately 50 feet below land surface at the ORWBG. The waste is buried at a depth of 20 feet. This provides a 30 feet buffer zone between the waste and the groundwater. Small fluctuations in groundwater elevation will have no impact on the buried wastes.

17) And what about the underlying soil surface that now exists? It has been compacted, is that not right?

Response to 17:

It has been compacted. The settlement that has occurred over the years has been filled in and the soil has been compacted over time as well.

18) What kind of plant cover are you planting on this?

Response to 18:

SRS will be using shallow-rooted local grasses.

19) I'm a little concerned about the soil cover itself. It's hard to tell since we don't know what the final action is going to be whether or not the soil cover will interact and cause us problems with the final action. I think some of the speakers have already raised that as an issue. I think it's a good question. At this time can you give us a guess, your best judgment on what the final action will be?

Response to 19:

If SRS were to do a RCRA cap down the road on the ORWBG, the soil cover SRS is putting in place would help toward the foundation. On the other hand, if SRS does an excavation type option, there will be a lot of void spaces in there after the waste is removed. This soil cover would then be utilized to help backfill those areas so that a nice sloped area would exist at the ORWBG. Looking at those two extremes, capping or excavation, this soil cover would help in either instance.

20) How much more expensive do you think the final action will be as a result of this action?

Response to 20:

Since SRS is only in the characterization phase for the Burial Ground Complex, it is premature to presume what the final action will be. Without knowledge of the final action, cost comparisons are impossible at this time.

21) Have you got any preliminary estimates at this time?

Response to 21:

No preliminary estimates have been done at this time.

22) I look at the sketch here and I notice that transuranic waste have been buried in this area; is that correct?

Response to 22:

That's correct.

23) And right now we really don't have very good, if any, characterization data about what we buried. And what concerns me is that if we put this kind of a load, it looks like an enormous load by putting all this soil over the ORWBG. Do we have the potential to collapse these boxes or steel cans or the things they were put? Are we risking a criticality? But if we have no idea what's buried out there, that's what you're telling me, we don't have characterization, we don't have records, we don't know where what is buried. And you're going to go press this material; is that correct?

Response to 23:

The instability and the potential for voids because of the material in the trenches have been thoroughly evaluated from an engineering design standpoint.

Many of the areas of the ORWBG have experienced significant subsidence (settling) over the years. These areas have been backfilled with soil, and the entire ORWBG is visually inspected every month to identify any areas that may require may require additional backfilling. For this reason SRS believes that many of the areas that would experience the greatest amount of subsidence have already been partially stabilized. However, SRS does anticipate that placement of the soil cover will cause further subsidence during and after construction. The construction subcontractor selected for this project will be experienced with landfill/buried waste site remediation. Prior to placing the soil cover, the contractor will stabilize the ground with a vibratory roller; any soft spots that appear will be backfilled prior to soil cover placement. Additionally, SRS plans a construction sequence and strategy with the contractor that will reduce the potential for subsidence during construction After the soil cover has been constructed, the ORWBG will continue to receive monthly inspections, and any subsiding or eroding areas will be repaired.

SRS further believes that the buried waste in the ORWBG trenches remains relatively contained by the surrounding soil. Also, the waste probably remains in a damp or moist condition due to the stormwater that percolates through the ORWBG. For these reasons, SRS does not believe there is a significant risk of airborne contamination due to collapsing voids in the waste trenches. In addition, the TRU wastes were encapsulated in concrete pours so criticality is not an issue.

Records exist which provide two dimensional locations for waste burials. These records also contain waste type and quantity.

24) Is there a way that these could be E-mailed or do they have to be sent on paper?

Response to 24:

Yes, comments can be E-mailed. Mary can be reached at the following E-mail address: MARY.FLORA @ SRS.GOV.

25) I think this way of approaching the burial ground, which I think everybody that is familiar with it recognizes it's actually one of the more complicated environmental remediation challenges at Savannah River Site. I think this is a very good approach. The notion that we're sitting down together, not trying for the final solution and just declare it done with, not letting the unanswered questions become an excuse for just delay and continued migration and contaminants, but instead trying to come up with a series of steps that will help you to both better control the problem and better come up with answers for the questions that have not been asked or answered tonight is really commendable and hopefully a sign of the way more of these decisions can be approached in the future.

Response to 25:

There is no response required since this was a statement of support.

Memo, dated February 28, 1996

To: Mary Flora, Manager
Environmental Management Public Involvement

From: Douglas E. Wyatt, Private Citizen
Aiken, SC

I would like the following two questions entered into the Public Record for the Old Radioactive Waste Burial Ground Interim Action Proposed Plan:

1. *In considering the remedial alternatives, the "tarp" cover was not mentioned, therefore I assume that it was not considered to be viable. What supporting construction documentation on engineering constraints and cost is available to support or disqualify the "tarp" cover and is it available for public review?*

Response to #1:

Using tarps to cover smaller buried waste sites on an interim basis is a strategy which has been used successfully at other DOE sites. This option, although not summarized in the IAPP, was included (30 mil High Density Polyethylene-Flexible Membrane Liner) in a 1993 report which evaluated temporary cover configurations for the ORWBG (WSRC-RP-93-1154, referenced in the IAPP). This report concluded that a soil cover was the preferred alternative.

The ORWBG currently is not well drained. Although measures have been taken by SRS Solid Waste Operations over the years to improve the situation, the problem remains that the ORWBG is essentially a large, flat area with undersized ditches and culverts. Any interim action that seeks to reduce infiltration will increase stormwater runoff. Therefore, regardless of the configuration chosen (soil cover, RCRA cap, tarp cover, or other), if the interim action decreases infiltration (thereby increasing runoff), the same magnitude of earth moving will have to occur to achieve a 3%-5% finished slope to promote proper drainage. Additionally, an upgraded stormwater management system, with larger ditches/piping/culverts will be required, regardless of the chosen option. Therefore a certain "earth moving/drainage improvement cost baseline" is established for any interim action alternative which reduces infiltration.

The soil cover alternative is a technically simple alternative to design and construct which does not interfere with future characterization or waste removal activities. The tarp cover alternative would involve essentially the same amount of earth moving and drainage improvement work, plus about 65 acres of the tarp cover to buy, place, and maintain. The permeability of such a tarp cover system would be lower, but the added value of this was judged to be marginal when balanced against the initial and recurring costs of such a large tarp area. For this reason, the tarp cover system was not considered as an alternative in the IAPP.

2. In the Gross Alpha measurements made for ORWBG groundwater, what are the values for uranium, plutonium, neptunium, and iodine isotope speciation and how do their concentrations compare over time and to health based risk standards?

I look forward to your support and consideration.

Response to #2:

Of the radioisotopes mentioned only Uranium isotopes (U-233/234 and U-238) have been identified as Constituents of Concern (COCs) in the groundwater at the ORWBG. COCs are determined through a rigorous process of statistical and nonstatistical analysis of monitoring data in accordance with RCRA groundwater regulations. The goal of this analysis is to identify contaminants which require continued monitoring and potentially groundwater remediation. Work towards the development of a RCRA Corrective Action Plan to address groundwater contamination at the ORWBG is underway.

The results of the COC development process and documentation of the analysis will be submitted to SCDHEC in the next revision to the RCRA Part B permit application for the MWMF this summer. Examination of data indicates that the occurrence of elevated levels of these contaminants is sporadic and that there does not appear to be a trend that is either increasing or decreasing with time. Summary statistics for these uranium isotopes are provided below.

Constituent	Units	Number of Measurements	Average	Maximum	Drinking Water Standard
Uranium-233/234	pCi/l	311	1.29	108	Sum of all alpha < 15 pCi/l
Uranium-238	pCi/l	322	1.66	231	Sum of all alpha < 15 pCi/l

Memo, dated February 29, 1996

To: Mr. Jeff Crane
Federal Facilities Branch
U. S. EPA, Region IV

From: Tim Connor, Associate Director
Energy Research Foundation

RE: Comments on WSRC-RP-94-1225, Rev. 1, Interim Action Proposed Plan for the Old Radioactive Waste Burial Ground (ORWBG)

Of the three interim action alternatives identified in the above document for the Old Radioactive Waste Burial Ground, Energy Research Foundation believes Alternative #2--Placement of a Soil Cover--to be the most prudent. Our support for this alternative is based on two considerations.

1) Given the existing contamination of both groundwater and surface water caused by rainwater infiltration into and through the waste trenches at the ORWBG, it is important to take short term actions that can reduce the infiltration and at least slow the movement of contaminants into and through the groundwater.

2) Given the large inventories of both toxic chemicals and long-lived radioactive materials at the ORWBG it is essential that every reasonable effort be made to reduce the potential for future migration as a result of continued leaching and groundwater transport, the potential for uptake through surface vegetation or animal burrowing, and the potential for direct exposure resulting from inadvertent excavation or intrusion into the waste itself. Such "reasonable" efforts may include selective removals or additional efforts to isolate and/or stabilize certain waste constituents. The interim action should not inhibit with the investigations necessary to aid decisions about the feasibility of additional remediation efforts, nor be an obstacle to the remedial actions themselves.

ERF's concern about Alternative #3--Placement of a RCRA-like Cap--is based on the latter consideration. Not only would the RCRA-like cap inhibit continued monitoring and investigations of the waste trenches, the added expense of the cap would at least create the appearance of a final remedy. Moreover, because it is plausible that actions needed to support a final remedy and the remedy itself would involve at least partial destruction of the RCRA-like cap, the existence of the RCRA-like cap could, by itself, impose a bias on these decisions.

ERF's support for an interim action is based on our view that the evidence and technical analysis developed to date does not support any decision about a final remedy. The evidence and technical analysis needed to support a final remedial action decision will need to address several issues that are not covered in the Interim Action Proposed Plan documentation. Among these issues are: best estimates of chemical and radionuclide inventories at the ORWBG, a thorough identification of waste categories and forms, identification of the location of the burials, the adequacy of the ORWBG site for the permanent disposal of long-lived wastes, the technical feasibility for the removal or stabilization of long-lived chemical and radioactive waste forms (i.e., certain transuranic wastes, filters containing long-lived radionuclides such as iodine-129,

mercury in plastic bottles, stainless steel vessels containing long-lived carbon-14 in deionizer resins), estimates of occupational exposures under specified removal or stabilization activities, and cost estimates associated with various options under the final plan.

Clearly, the decision about a final remedial action for the ORWBG will have to be made within the context of a strategy for the Burial Ground Complex as a whole. This strategy will not only have to consider possible future site uses up to and beyond a presumed institutional control period, but also address long-term environmental quality issues associated with affected groundwater (most notably the Congaree aquifer) and affected surface streams (Four Mile Creek and Upper Three Runs Creek). As yet, there is no strategy and supporting analysis that addresses these issues.

Finally, the discussion of the scope and role of the proposed response action within the site strategy would be improved by a more detailed discussion on the progress on the Burial Ground Complex Field Investigation Plan and how it relates to issues that are expected to be addressed in the RFI/RI/BRA phase with respect to the ORWBG. Included in this discussion should be some indication of how relevant public comments received during this interim action process will be transferred to the decision making process on a final remedial action for the ORWBG.

Response:

Implementation of the Field Investigation Plan (FIP) is well underway. Characterization of the plume at the ORWBG has been completed in accordance with the FIP and submitted to SCDHEC in revision 3 to the RCRA Part B permit application for the MWMF.

Groundwater sampling via Cone Penetrometer hydrocone and Hydropunch to delineate the vertical and lateral extent of the three burial ground plumes has been completed. Twenty three (23) new wells have been installed to monitor groundwater flow and contamination in the vicinity of the groundwater divide. Soil, wetlands, and stream sampling are in progress. Data evaluation is ongoing.

Additional coring and water sampling to gather information in data sparse areas around the Burial Ground Complex are planned for later this year. This data will be used to improve the ability of groundwater models to predict future contaminant migration. This data will also improve our ability to model the interaction effects of multiple caps and groundwater remediation projects in the vicinity of the Burial Ground Complex. Pumping tests to gain information which will support corrective action design are being planned and are scheduled for execution in FY 1997.

The results of the BGC FIP characterization will be used to develop the BGC RCRA Facility Investigation/Remedial Investigation/Baseline Risk Assessment (RFI/RI/BRA) Report. The results of the RFI/RI/BRA will be used to develop the final remedial alternatives for the BGC including the ORWBG.

Public Comment Card, postmarked March 2, 1996

To: Mary Flora

From: L. Hanks, Public Citizen
North Augusta, SC

I never did hear what is growing on top of the ORWBG now. Grass on a dome field or like a football field does the best with water. The best way to solve the problem is to dig it up, check the damage, and reinstall waste in new groundwater proof facilities. That's called clean-up.

Response to comment:

The ORWBG is currently covered by a mixture of shallow-rooted local grasses, not unlike a residential lawn. This grass cover receives regular mowing. Some areas of the ORWBG are "mounded" to promote drainage, but the overall topography of the area is generally that of level land. Future investigation/assessment activities for the Burial Ground Complex, including the ORWBG, will determine the best way to proceed with the final remedial alternative for the ORWBG. Suggestions such as yours will be considered for the final remedial alternative.

Memorandum, dated March 4, 1996

To: Anne Roe, SW&ER Public Involvement

From: George Minot, Public Citizen
Hilton Head Island, SC

RE: Old Radioactive Waste Burial Ground IAPP
Remedial Alternatives for F- & H-Area Groundwater Operable Unit

First, thank you for your responsiveness to my January 31st request for information regarding the IAPP for ORWBG.

General Response:

The supplemental information that was provided at your request was excerpted from several documents. Figures and tables from various sources were chosen in an attempt to provide specific answers to your questions. The questions posed in your most recent letter indicate that you are interested in understanding the program in greater detail. Therefore, we are sending you a copy of the RCRA Part B permit application for the MWMF (rev 3), dated November 1995. This document contains the hydrologic characterization of the plume of contamination from the ORWBG. It describes the program underway to address groundwater contamination at the Burial Ground Complex. The document also contains information about the buried wastes. We hope that this document will address your comments in greater detail and provide a fuller understanding of the groundwater program than we can provide in this letter.

Next, I have reviewed the materials received and have the following questions and comments:

1. The groundwater data furnished is principally from well locations outside the ORWBG, according to the map showing the monitoring well locations. Where is the data for wells with designators BG, MGA, MGC, MGE, etc.?

Response to Comment 1:

Groundwater characterization data that has been provided for the plume of contamination from the ORWBG is from the RCRA Part B permit application for the MWMF. The characterization is based on data from the RCRA approved monitoring well network and the SCDHEC approved sampling program utilizing direct push technology (a geologic sampling tool that is pushed into the ground to collect groundwater samples). These RCRA approved wells are in compliance with specific requirements for well construction and sampling and analysis procedures defined in the RCRA regulations and the SCHWMR regulations. The purpose of the well construction and sampling and analysis requirements is to assure consistency and accuracy in data submitted to SCDHEC and EPA which is used to make engineering and regulatory decisions about groundwater remediation. Wells

with designators BG, MGA, MGC, and some other wells in and around the Burial Ground Complex are old and do not meet the regulatory requirements, therefore data collected from these wells cannot be used to support RCRA activities. Historical data exists for these wells, but most of them have been abandoned. Data from the old wells confirms that elevated levels of tritium are present in groundwater beneath the ORWBG.

2. *The groundwater data reflecting the Maximum Levels of Constituents Exceeding the Final Primary Drinking Water Standards is structured in a manner that is not understandable to me. For example, I understand the Maximum Contaminant Level (MCL) for tritium to be **20 pCi/m**. How does this translate to the Primary Drinking Water Standard of **2.0E-05** shown on Table 9-2 of the 1992 SRS Environmental Report?*

   Also, the maximum level of Tetrachloroethylene recorded at Well BGO 7D for 3Q94 is 193 ug/L. How does this translate to the Primary Drinking Water Standard of .00050 mg/L for PCE shown on Table 9.2 of the 1992 SRS Environmental Report?

Response to Comment 2:

The maximum tritium concentration reported in the RCRA monitoring well network at the Burial Ground Complex is 286,000,000 pCi/l. The MCL for tritium is 20,000 pCi/l.

Please note that because of the cumbersome nature of numbers with so many decimal places, tritium concentrations are often reported in terms of pCi/ml or in scientific notation. The MCL for tritium of 20,000 pCi/l may be expressed as 20 pCi/ml or in scientific notation as $2E^{+01}$ pCi/ml (or less commonly $2.0E^{+04}$ pCi/l, or $2x10^{+04}$ pCi/l, or $2.0x10^{+01}$ pCi/ml). All of these notations are correct, however, it is good practice to use a single set of units and a single notation format throughout a document. SRS apologizes for any confusion caused by our failure to adequately describe the units and notations cited in the supporting documentation provided at your request.

The maximum value of tetrachloroethylene (PCE) reported at wells monitoring the plume originating at the ORWBG is 304 ug/l. The MCL for PCE is 5 ug/l. This same unit of measurement (ug/l is the abbreviation for micrograms per liter) is also sometimes referred to as ppb (for parts per billion).

3. *According to my calculations, the groundwater tritium concentrations mentioned on page 11 of the ORWBG IAPP range from a minimum of 75% of the MCL to a maximum of 1,500,000% of the MCL, with an average of 7037.25% of the MCL. Is this correct?*

   If so, to my knowledge, this represents a considerably higher concentration of tritium that has been previously reported for these aquifers (i.e., the mid-1993 tritium-contaminated groundwater plume, as defined by the 1,000 pCi/mL tritium isoactivity contour, contained zones of tritium concentrations as high as 1,500% of the MCL in the F-Area and 800% of the MCL in the H-Area. Figure E.4-3 (Tritium Activities in Aquifer Zone IIB) in the Southwest Plume Area only reflects an area of concentration of 5000% of the MCL for tritium. Figure E.4-6 (Tritium Activities in Aquifer Zone IIB) in the Southwest Plume Area reflects an area of concentration of 500% of the MCL for tritium. Figure E.4-10 (Cross Section M-M' Showing Tritium Activities for the Southwest Plume Area only

reflects an area of concentration of 2500% of the MCL for tritium. I am confused - where is the maximum concentration of tritium mentioned on page 11 ? Where did it come from? When did it first appear in the groundwater info?

Response to Comment 3:

The maximum tritium concentration reported in the RCRA monitoring well network at the Burial Ground Complex is 286,000,000 pCi/l. The MCL for tritium is 20,000 pCi/l. The highest concentration of tritium is more than 100,000 times the drinking water standard. The highest values of tritium in the RCRA monitoring network have been measured consistently over a period of several years at well BGO-28D. This well is located at the perimeter of the ORWBG near the southwest corner of the fence line. Historical data from old wells within the ORWBG indicate that levels of tritium greater than 100,000,000 pCi/l have also been measured within the ORWBG.

The concentration of tritium in the plume of groundwater contamination associated with the ORWBG is higher than the concentrations observed in the F and H Area Groundwater Operable Units. The extent of the plume from the ORWBG has been well defined in the last year. The results of this characterization were submitted to SCDHEC in revision 3 of the RCRA Part B permit application for the MWMF in November 1995. In the RCRA documentation, the plume of contamination from the ORWBG is referred to as the "southwest plume" because it is one of three plumes at the Burial Ground Complex and it is located southwest of the Burial Ground Complex (Figure E-1, page E-2). The southwest plume originates in the ORWBG and seeps into the old F Area effluent creek which flows into Four Mile Creek in the area between the F Area seepage basins and the H Area seepage basins. Maps of the tritium plume indicate the location of the highest concentrations of tritium as well as the lateral geometry of the plume in each aquifer (Figure E.4-3, page E.4-6 and Figure E.4-6, page E.4-9). Cross sections of the tritium plume are provided in order to illustrate the vertical geometry of the plume and may not include the area of highest contaminant concentrations (Figure E.4-10, pages 4.4-15/16).

4. *The remedy addressing groundwater contamination in the F- and H-Area Groundwater Operable Units (which I understands includes the groundwater contamination plumes in a zone which extends from the water table surface to approximately 150 feet below the surface), as outlined in the Interim Action ROD Remedial Alternative Selection for F -and H-Area Groundwater Operable Units provides three phases for the recovery of contaminated groundwater via extraction wells and treatment of hazardous constituents and radionuclides (except tritium and nitrates; however, injection of the treated water will partially control the movement of tritium-contaminated water by lengthening the tritium flow to the seep lines).*

   It is not clear from the description of the F- and H-Area Groundwater Operable Units that the contamination plumes associated with the ORWBG IAPP are separate plumes; however, if not, I suspect there are no more than "bright lines" on some cross-sectional map separating these underground plumes. What is the schedule for implementing the alternative/remedy selected in April 1995? What effect does or will this previous decision have on the Preferred Alternative described on page 17 of the ORWBG IAPP?

I await your reply!

Response to Comment 4:

There is some mingling of tritium plumes from the H Area Seepage Basins and the ORWBG. This mingling occurs outside the plume area to be addressed in the first phase of groundwater remediation at the H Area Seepage Basins. Phase 1 of the groundwater remediation project at the F and H Area Groundwater Operable Units is presently under construction. Start up of treatment is planned for early 1997. The decision to pump and treat groundwater at the F and H Area Seepage Basins has no direct influence on the interim action proposal to put a soil cover on the old burial ground, but any corrective action proposed for the plume from the ORWBG will complement the ongoing program at F and H Area Seepage Basins and will be enhanced by the placement of a soil cover on the ORWBG.

It is the goal of SRS to address all of the groundwater contamination in the entire area in a comprehensive manner. All the planned and proposed actions are part of an integrated strategy to address groundwater at these adjacent facilities in a manner that is technically sound, cost effective, and complies with all applicable environmental regulations. The first step in groundwater remediation is to control the source of contamination. Placement of a soil cover on the ORWBG will achieve that first step by reducing the amount of contamination that reaches the groundwater, and it will achieve it in a manner that will allow continued work toward the development of the best final solution for dealing with the ORWBG.